BEFORE THE
PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local Procurement Obligations.	)	Rulemaking 11-10-023

CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION PROPOSAL ON PHASE 1 ISSUES

In accordance with the Order Instituting Rulemaking (October 20, 2011) issued by the California Public Utilities Commission ("CPUC" or "Commission") and the Phase 1 Scoping Memo and Ruling of Assigned Commissioner and Administrative Law Judge (December 27, 2011)("Scoping Memo"), the California Independent System Operator Corporation ("ISO") respectfully submits its proposal on the issues described in the Scoping Memo for consideration in this proceeding.[1]

I. EXECUTIVE SUMMARY

The ISO commends the Commission for its continued efforts through this series of rulemaking proceedings to refine the resource adequacy program and enhance the ability of the program to ensure that sufficient resources are available where and when needed. It is important that the CPUC, ISO, and stakeholders consider issues and proposals that will refine or enhance the resource adequacy program so that it better serves to facilitate open and efficient competition that will produce the optimal, cost-

[1] The ISO reserves the right to address the other issues listed in the Scoping Memo for Phase 1, and any new matters, in response to the proposals submitted by other parties.

effective mix of existing resources and new infrastructure investments sufficient to meet end-use demand at stable and reasonable prices and reliably provide for the operating requirements of the ISO balancing authority area.

In order to maintain an effective resource adequacy program, the ISO submits this flexible capacity procurement proposal to establish a flexible capacity procurement requirement for the 2013 resource adequacy compliance year. Specifically, the ISO proposes the following:

- Incorporate flexible capacity procurement targets into the resource adequacy program to ensure sufficient flexible capacity is procured for 2013 that has a regulation and load-following capability and can respond accurately to ISO dispatch instructions. The flexible capacity procurement targets should reflect the ISO's needs for a certain portion of the overall resource adequacy fleet to provide regulation (1-minute ramping), load following capability (15-minute ramping), and maximum ramping (continuous single direction ramping capability).
- Set the 2013 flexible capacity requirements to levels that will maintain the regulation, load-following, and maximum ramping attributes of the 2012 resource adequacy fleet. This will serve as a base case for flexibility for future years; however, the ISO will work with parties in this proceeding to refine the analytical methods for determining flexible capacity requirements that will be used in subsequent years.
- Identify the capability for all resources to meet the flexible capacity targets so that entities will know how each resource will count when performing

procurement. This is similar identifying the net qualifying capacity prior to each RA compliance year.

- Combine the resource adequacy showings of the load serving entities for 2013 to determine if, for the procured resource adequacy capacity, all three flexible capacity targets have been met -- regulation, load-following capability, and maximum ramping. If all three targets are met, no additional procurement will be required for the resource adequacy compliance year.[2] If there is a shortage in any category, then the ISO will post a report and request that additional capacity be procured by load serving entities to cure the deficiency within 30 days. If the deficiency is not corrected, the ISO will procure the required capacity through a new backstop procurement mechanism; the form of the new procurement authority and allocation of backstop procurement costs will be addressed in an upcoming ISO stakeholder process.
- Extend the current year-ahead resource adequacy showing from a showing only for the five summer months to a showing for 12 months in order to facilitate a more meaningful assessment of the flexible attributes of the resource adequacy fleet in the shoulder months.

As explained in greater detail below, the ISO believes these refinements to the resource adequacy program are necessary at this time to ensure that the resource adequacy fleet has sufficient operational flexibility to maintain a reliable electric system

[2] This proposal addresses resource adequacy flexibility requirements based on the current annual resource adequacy approach. This proposal does not encompass any existing issues with generating units at risk of retirement for the relevant resource adequacy compliance year.

in California. Increasing volumes of variable energy resources to comply with the 33 percent renewable portfolio standard will increasingly displace flexible resources needed to meet resource adequacy capacity requirements unless timely refinements are made to the existing resource adequacy program. Without resource adequacy contracts, existing flexible resources may not receive sufficient revenues from the energy and ancillary service markets to remain economically viable, making them at risk of retirement. In addition, large volumes of existing flexible resources may shut down to comply with the state's once-through-cooling mandate adopted by State Water Resources Control Board.[3]

The ISO is cognizant that this proposal requires changes to the ISO's tariff in order to implement the proposal and ensure that all load serving entities participating in the ISO markets meet the same resource adequacy requirements, not just those load serving entities under CPUC jurisdiction. The ISO will launch a stakeholder process in January 2012 to develop the tariff changes necessary to support a flexible capacity procurement resource adequacy requirement.

II. BACKGROUND AND DISCUSSION

The need for traditional, flexible generation that can balance the swings in net load (i.e., load net of variable generation) is increasing while capacity and energy revenues for these units decrease and their costs increase. As renewable capacity and energy output increase, revenue opportunities (ISO market, resource adequacy contracts) for the conventional generation fleet are likely to diminish absent significant

[3] While some retirement of once-through-cooling resources may be accommodated as sufficient fleet flexibility, prior studies indicate that if retirement of all planned once-through cooling resources were to occur, insufficient flexibility will occur potentially as early as 2018 assuming other resources remain available.

changes to the regulatory/market structure. Substantial revenue reduction for flexible conventional resources increases the probability that some of these resources will retire. While there may be a decreasing need for the total energy output from conventional, flexible resources, there is still a real operational need for the flexibility these resources provide, especially during critical ramping periods. Thus, the Commission's resource adequacy program, and the programs of other local regulatory authorities, must ensure that these flexible resources remain viable and available to the ISO to maintain system reliability and to minimize the need for procurement through ISO backstop capacity procurement mechanisms. The two primary reasons for the ISO's concern that there may not be sufficient flexible capacity to ensure future reliability are the reduced revenue streams for flexible conventional resources due to the displacement of capacity and energy rents from increasing numbers of renewable resources and the reduction in flexible capacity due to the once through cooling mandate.

In addition, the CPUC's resource adequacy program currently imposes local and system resource adequacy procurement obligations on its jurisdictional load serving entities for each month in the resource adequacy compliance year. However, to date, the Commission has not imposed an obligation for its load serving entities to procure resources with specific operational characteristics. In neither their year-ahead nor month-ahead resource adequacy showings are load serving entities required to demonstrate that they have procured capacity with specific operational characteristics. Accordingly, the characteristics of the resource adequacy fleet available to reliably operate the grid during the compliance period may or may not meet the required

operational flexibility required by system conditions.

By 2020, the state's load serving entities will be required to have 33 percent of their energy provided by renewable resources. The ISO has been actively planning for the large-scale integration of renewable resources, as they increase each year leading up to 2020, and has identified several areas of concern, including:

- In order to reach a 33% renewable portfolio standard, large numbers of intermittent renewable resources are being procured by load serving entities and are inter-connecting to California's electricity grid.
- Without timely modification to the Commission's resource adequacy program, inflexible and variable resources will displace resource adequacy capacity sourced from traditional flexible resources that have historically satisfied the CPUC's resource adequacy capacity requirements. Unlike most conventional resources, many renewable resources operate on intermittent fuel supplies, such as sunshine and wind, and are incapable of responding to dispatch instructions. Instead, they generate as much as they can whenever they can.
- ISO studies show that intermittent resources increase supply variability and decrease supply predictability, which require greater readiness and response from flexible generation. These studies also demonstrate that increases in the penetration of renewable resources will result in decreasing energy market revenues for traditional, flexible generation as more energy is provided by renewable generation. Moreover, the traditional, flexible generation resources will be cycled more frequently,

causing greater wear and tear and increasing operating costs.

- California's State Water Resources Control Board has promulgated rules that eliminate once through cooling resources by the end of 2020. As a result, many existing, flexible generation resources are impacted and will either repower or retire beginning in 2017.

Based on these considerations, the ISO seeks to ensure that sufficient flexible resources are available to maintain reliability. As a partial response to the problem, the ISO will initiate a stakeholder process near the end of January 2012 to consider new annual backstop procurement authority to retain at risk resources that are identified as being essential to maintaining system reliability in the intermediate future (ex., 2017-2018). The ISO maintains that it is both feasible and timely for the Commission to incorporate a flexible capacity procurement requirement into the resource adequacy program for compliance year 2013 and beyond.

III. FLEXIBLE CAPACITY PROCUREMENT PROPOSAL

A. Flexibility Requirements For The Resource Adequacy Program

The ISO proposes that the CPUC, using ISO studies, establish flexible capacity procurement requirements as part of the resource adequacy program. The ISO recommends that the requirements be based on the data and results presented in studies the ISO has performed of the impacts of increased variable renewable generation and that the requirements be established for three flexible capacity procurement categories. Table 1 below describes the three categories of flexibility that the ISO proposes. These three categories correspond to what ISO studies performed to date have presented as regulation, load following, and total ramping needs.

Regulation is the capability of a generating unit to respond to four-second signals from the ISO to adjust its output to balance the system. Load following capability is the capability of generating units to respond to the ISO's five-minute dispatch instructions to balance load and generation. Maximum ramping needs reflect the flexibility needs to ensure the longest continuous net load ramp can be achieved by the fleet. Review of 2011 data indicates that the longest continuous net load ramp is as much as 11 hours at an average ramp rate of nearly 30MW/min. In the future, it may be necessary to further refine these categories and/or add additional requirements to align with operational requirements and market structures. While recognizing that such future modifications may be required, the ISO believes it is appropriate and timely to adopt these three categories for the upcoming 2013 resource adequacy compliance year.

The ISO expects increasing amounts of variable renewable generation capacity to come on line in the next few years. Waiting to implement flexible capacity procurement requirements will leave no time to make refinements and adjustments to the existing resource adequacy program, which could jeopardize future reliability. Further, adopting the basic procurement structure now gives load serving entities time to adjust and shape their procurement practices and portfolios while they are still in the process of acquiring renewable generation; waiting until their portfolios are fully procured to meet the 33% renewable portfolio standard will be too late and could have costly impacts that could be avoided by taking action now.

TABLE 1

ISO Proposed Flexible Requirement Categories

Maximum Ramping	Load Following	Regulation
Maximum Continuous Ramping for the Month	15-Minute Ramping	1-Minute Ramping
Requirement determined by longest continuous ramp • MW of ramp possible during longest continuous ramping period	Requirement is the 15-minute ramping capacity need	Requirement is the need for regulation expressed in ramp rate of MW/min
Units must respond to ISO dispatch instructions. Renewable generation, base load units, and units that self-schedule are not eligible.	Unit must respond to ISO dispatch instructions.	Units must be regulation certified
Each resource's contribution is ramping capacity over the time period: • Pmax – Pmin if the unit cannot start quick enough • Pmax if the unit starts and reaches Pmax during the ramp interval (example - if longest ramp interval is 5 hours for the month, a resource that starts and gets to its maximum output in less than 5 hours can count its Pmax toward maximum ramping requirements)	Each resource's contribution is the minimum of: • Pmax-Pmin • Ramp Rate(/minute) * 15minutes • Ramp Rate based on the MW weighted average ramp-rate of the resource for a resource with different ramp-rates for different operating ranges(i.e., use the megawatt size of the operating zone to weight the ramp rate for that zone).	Ramp rate based on the MW weighted average ramp rate of the resource for the operating ranges where it can provide regulation.

Similar to how local capacity counts as system capacity, the ISO proposes that the three flexible capacity targets contribute to the overall generic capacity need

resulting in four capacity categories. The four capacity categories are: generic capacity, maximum ramping, load following, and regulation. This structure is illustrated in Figure 1, attached at the end of this proposal.

It should be noted that some units may be eligible to provide all categories of flexible resource adequacy capacity, while others are only eligible to provide generic resource adequacy capacity (i.e., no flexibility). Additionally, the categories are not mutually exclusive. The same unit may fulfill all four flexible capacity requirements; using a specific unit, or the capacity of a unit, to fulfill one of the flexible requirements does not mean that unit or capacity cannot count toward the requirements in another flexible category. For example, a 500 MW unit with a Pmin of 300 and a ramp rate of 10MW/min which is regulation certified and can start up in 3 hours and is not self-scheduled would provide the following amounts of flexible resource adequacy capacity:

Generic Capacity	500 MW
and	
Maximum Ramping	500 MW (assumes maximum ramping period greater than 3 hours)
and	
Load Following	150 MW (10 MW/min. * 15 mins.)
and	
Regulation	10 MW (per minute ramp rate)

Another unit, which has capacity of 500 MW, a start time of 18 hours to reach full power, a Pmin of 200 MW, and a ramp rate of 5 MW/min, and is not regulation certified nor self-scheduled, would provide the following amounts of flexible resource adequacy

capacity:

Generic Capacity	500 MW
and	
Maximum Ramping	300 MW (Pmax – Pmin, assumes maximum ramping period greater than 1 hour and less than 18 hours)
and	
Load Following	75 MW (5 MW/min * 15 minutes)
and	
Regulation	0 MW (not regulation certified)

In both examples above, the generating unit would count for those numbers in each category. The first generator counts for 150 MW of load following, and this does not diminish the amount of maximum ramping or generic capacity that the unit would provide; it would count as 500 MW of generic capacity, 500 MW of maximum ramping, 150 MW of load following, and 10 MW of regulation. The relationship between the flexible capacity categories is illustrated in Figure 1, attached at the end of this proposal.

The ISO's proposal provides assurance that, not only is there sufficient resource adequacy capacity available to the ISO, but that capacity will provide sufficient flexibility for the ISO to reliably operate the grid. As an example, if the 15-minute ramping need is 3,000 MW, but the resource adequacy fleet has the capability of ramping 2,500 MW in 15 minutes, then the ISO cannot ensure that it has the necessary resources available to respond when operation of the grid requires that level of ramping capability. Adopting the ISO's proposed flexible capacity procurement requirement will help to ensure that not only can the California grid meet demand on the peak day, but the grid can respond

to ramping requirements that occur throughout the year, not just on the peak day.

Additionally, the ISO proposes that these flexibility requirements be established for each month. Establishing the requirements monthly will recognize that the amounts of flexible capacity needed may differ month by month. For 2013, the ISO proposes that the monthly requirements be established by applying a factor to the fleet flexibility available for each category for the Summer peak month. The factor will be based on the ratio of observed requirements in the specific month to the summer month. For example, under the assumptions that for August 2013 the current RA fleet capability of 10,000 MW of regulation needs to be maintained and that the load level in January is 60% of the load level of August, the regulation requirement for January 2013 will be 6,000 MW. Further, monthly requirements allow some generation to provide different categories of capacity during different months. Hydro resources may not have any flexibility during the spring run-off when they must let water through, but in the summer months they may provide a large amount of flexible capacity.

1. Maximum Ramping

The ISO proposes that the first category, maximum ramping, be defined as the total capabilities of the fleet to respond to dispatch instructions during the expected largest ramping interval. The total ramping requirement is designed to ensure that there is sufficient ramping capacity to meet the ISO's largest continuous ramp. The total ramping capacity needed to meet the ramp is expressed in MWs. For example, assume the longest continuous ramp is a ramp from 25,000 MW at 7:00 a.m. to 42,000 MW at 6:00 p.m. The total MW for the ramp is 17,000 MW in 660 minutes,.

The ISO proposes that units unable to respond to the ISO dispatch instructions

cannot count as maximum ramping capacity. This includes most renewable generation resources, which generate only when the sun is shining or the wind is blowing, base load generation, such as the nuclear units that do not respond to dispatch instructions unless there is a system emergency, and resources that self schedule. One issue that must be considered is how use limited resources will be able to count toward meeting the continuous ramping flexibility requirement

In order for a unit's flexibility to be useful to the ISO in meeting ramping needs, the unit must be able to respond to ISO dispatch instructions. This excludes any unit that plans to self-schedule through real time. The ISO is still collecting information as to the appropriate method to determine how much maximum ramping capacity a resource is able to provide. If the time for the ramping is 11 hours, resources that take longer than 11 hours to start and reach full power (Pmax) should only count the capacity between Pmin and Pmax, assuming that in the 11-hour period they can fully ramp that megawatt amount. Other resources with the ability to start and reach full power in less than 11 hours should count their capacity from 0 to Pmax, again assuming that they ramp to full power during the 11-hour period.

To determine whether the procured resource adequacy capacity meets the maximum ramping requirement, the ISO will examine the portfolio of all resource adequacy resources provided by CPUC jurisdictional load serving entities and those load serving entities which are jurisdictional to other local regulatory agencies . The ISO will sum maximum ramping capacity of each resource. The procured resource adequacy capacity will meet the maximum ramping requirement if the portfolio capacity exceeds the minimum monthly amounts established for maximum ramping resources.

2. Load-Following Capability

The second proposed flexible capacity requirement is load-following capability. The load-following requirement is designed to correspond to the "load-following" requirements that have been calculated in the various ISO renewable integration studies. The ISO proposes to define load-following based on an assessment of the maximum 15-minute ramps predicted during a month and use this to construct the 15-minute ramping requirement. The ISO proposes 15 minutes for the load-following capability requirement because this is same time period used in the ISO's real time preliminary dispatch, which is where and when unit commitment is done. In the five-minute dispatch, the unit commitment is assumed fixed..

To determine the load-following capability of a resource adequacy resource, the ISO proposes that the resource must be capable of meeting the lower quality flexibility capacity requirements. Assuming a resource meets the foregoing requirement, the 15-minute ramping capacity of the resource is the minimum of its:

- Pmax – Pmin; and
- (weighted average ramp rate per minute) * 15 minutes

For example, a 500 MW resource with a Pmin of 300 MW and Pmax of 500 MW and a weighted average ramp rate of 10 MW/min contributes 150 MW to the load following capabilities of the fleet because 150 MW (its ramp rate of 10 MW/min multiplied by 15 minutes) is less than its Pmax – Pmin (200 MW). This resource's contribution to load following is limited by its ramping capabilities in 15 minutes. A different resource with a Pmax of 50 MW, and a 5 MW/ min average ramp rate contributes 50 MW to the resource adequacy fleets' load following capabilities because

its Pmax – Pmin (50 MW) is less than its ramp rate multiplies by 15 minutes (5MW/min * 15 min = 75 MW). This second resource's contribution to load following is limited by its capacity not its ramp rate.

. To determine if the procured resource adequacy capacity meets the load-following requirement, the ISO examine the portfolios of all resource adequacy resources provided by CPUC jurisdictional load serving entities and those load serving entities which are jurisdictional to other local regulatory agencies.. The ISO will sum the 15-minute ramping capacity of all resource adequacy resources capable of providing load-following capability by month. If this number exceeds the load-following requirement for the relevant month, then the procured resource adequacy capacity meets the load-following requirement for that month.

3. Regulation

Regulation is an ancillary service that is procured by the ISO to respond to changes in load and/or generation between the economic dispatch periods. Regulation units must have the capability to respond to automatic generation control signals, which are issued every 4 seconds. The ISO's studies of integrating renewable resources showed that the increased variability in net load will lead to an increased need for regulation to balance the grid between economic dispatch periods. The requirement for regulation for the procured resource adequacy capacity will be expressed as a MW/min ramp rate.

Only resources that are certified to provide regulation to the ISO as an ancillary service are eligible to satisfy the regulation capacity requirement. To determine the regulation capacity requirement's one minute ramp rate, the ISO will look at the

weighted average ramp rate of a unit over the range for which it can provide regulation. The procured resource adequacy capacity will have met the regulation capacity requirement if the sum of the one minute regulation ramp rates from all resource adequacy regulation resources exceeds the requirement for each month.

B. Implementation of Flexible Capacity Requirements for Resource Adequacy Compliance Year 2013

For the 2013 resource adequacy compliance year, the ISO proposes that the capacity needed for each of the three flexible capacity categories will be determined by analyzing the ramping capability of the 2012 resource adequacy fleet in each of the three categories. This analysis will provide the minimum flexibility requirements needed for regulation, load–following capability and maximum ramping for 2013, using 2012 as the base year. This will ensure that the flexibility of the 2012 resource adequacy fleet will be maintained in resource adequacy capacity procured for the 2013 resource adequacy compliance year.

The ISO urges the Commission to adopt the flexible capacity requirement in this proceeding. It is critical that for the 2013 resource adequacy compliance year, the CPUC adopt a structure and flexible capacity targets that are based on the 2012 resource adequacy fleet. This will ensure that the existing resource adequacy fleet flexibility is maintained without further degradation. The ISO believes the 2012 resource adequacy fleet will meet the flexibility needs for 2013. While not a long-term solution, this proposal provides a simple, easily implemented approach in order to establish requirements for 2013. If the capabilities of the 2013 procured resource adequacy capacity are the same or better than the 2012 resource adequacy fleet, the ISO

believes that there should be sufficient flexible capacity to reliably operate the grid. Establishing the requirement for 2013 is a very important first step. It will provide a foundation upon which to build and establish requirements for 2014 and beyond. This methodology also provides time for the ISO and stakeholders to develop an analysis based requirements.

C. Method for Handling Deficiencies

Under the ISO's proposal, the resource adequacy showings for the three categories of flexible capacity will be evaluated in aggregate. Load serving entities' resource adequacy portfolios will not have specific targets or percentages of "flexible capacity." If, in aggregate, there is a shortage in procurement of flexible capacity, the ISO will post a report detailing which category or categories are short. Load serving entities will then have an opportunity to remedy the deficiency by procuring additional capacity in the shortage category. If, the opportunity for the load serving entities to remedy the shortage ends and a shortage still exists, the ISO proposes to backstop the shortage and procure capacity to meet the requirements. The form of this new type of backstop procurement and the allocation of the backstop procurement costs will be considered during the ISO stakeholder process prior to filing a tariff amendment.

The ISO believes that the methodology described in this proposal provides an effective way for ensuring the resource adequacy portfolios provide the ISO with sufficient flexible capacity while avoiding over-procurement and excessive costs. Establishing hard procurement requirements for flexible capabilities for each load serving entity could result in over-procurement of the flexible capacity and lead to excessive costs due to the lumpy nature of generation and the lack of a market to

procure minimal quantities of generation for resource adequacy.

D. Extend Year-Ahead Resource Adequacy Showing To All Months

Under the Commission's current resource adequacy program, load serving entities are required to make a year-ahead system and local resource adequacy requirement compliance filing for the applicable compliance year that demonstrates compliance with the year-ahead system resource adequacy obligation, which is 90% of the total load plus planning reserves only for the five summer months of May through September of the applicable compliance year. In order to provide a more robust assessment of the flexible resource operational characteristics that are needed to meet the monthly flexible capacity requirement, the ISO proposes that the Commission extend the year-ahead showing requirement to the full 12 months of the compliance year. Requiring resource adequacy showings for the additional months beyond the summer months is crucial because the ISO has found that the flexibility of the existing fleet is significantly diminished during the shoulder months when conventional resources generally schedule maintenance outages.[4] As noted above, shoulder months will require significant ramping capabilities, particularly as variable energy resources comprise a larger and larger percentage of the overall generation fleet. It is for these non-peak periods when variable generation is often at high levels and load is at low levels, and few other flexible resources are running, when the year-ahead monthly showings would be a valuable source of information about resource adequacy.

[4] See the ISO's 2011 assessment report, posted on its website at http://www.caiso.com/Documents/Supplement_August2010Report_Integration_RenewableResourcesOperationalRequirements_GenerationFleetCapability_20RPS.pdf

IV. CONCLUSION

It is critically important to ensure that, in addition to system and local resource adequacy capacity, the procured resource adequacy capacity contains needed flexibility characteristics to ensure the reliable operation of the grid. The ISO's proposal will accomplish that and should be adopted for the 2013 resource adequacy year. The ISO recognizes that this proposal will require changes to its tariff to ensure that the modification to the resource adequacy process applies to all load serving entities, not just those jurisdictional to the CPUC. The ISO will shortly begin its own stakeholder process to work through the tariff changes required for the implementation of this proposal. The ISO anticipates that its stakeholder process and the CPUC resource adequacy proceeding will be working in parallel and will coordinate with the CPUC to ensure that all parties, both CPUC jurisdictional and others, are informed and able to participate in the processes. For the foregoing reasons, the ISO respectfully requests that the CPUC issue an order consistent with the ISO's proposal.

Respectfully submitted,

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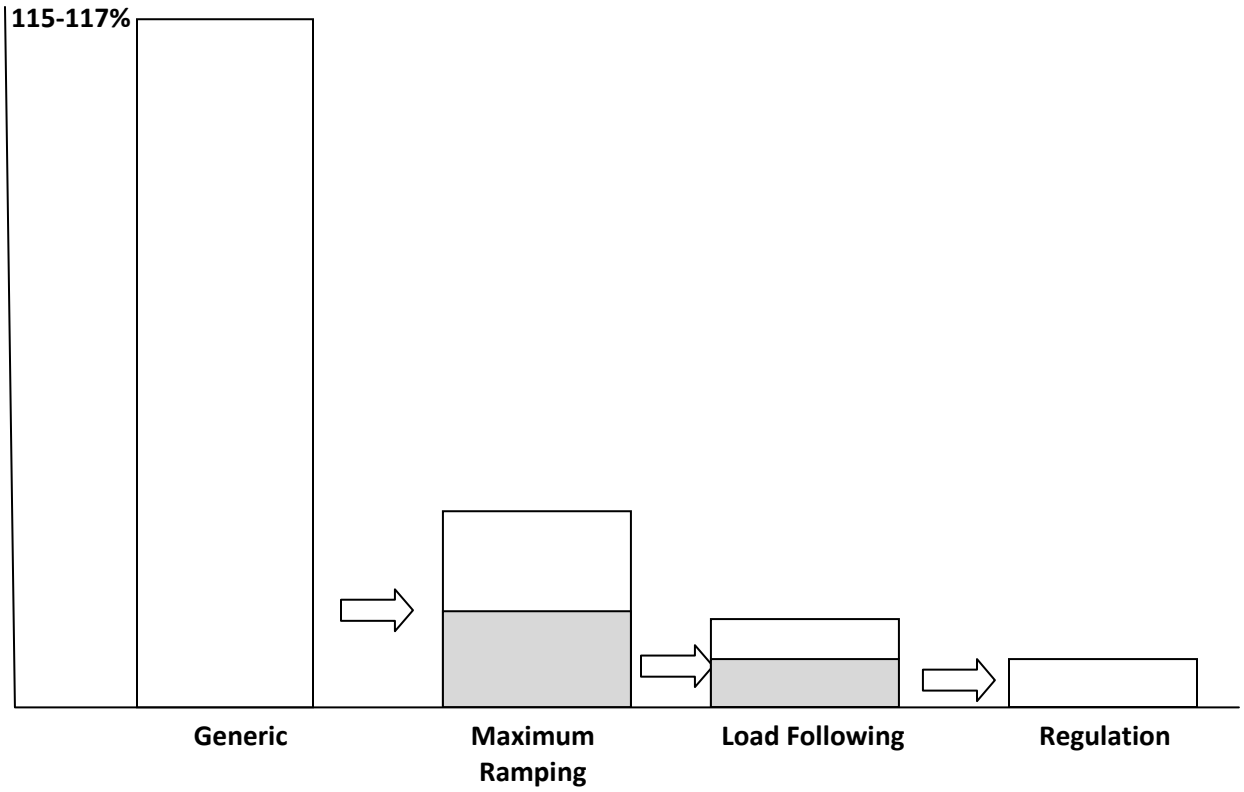
FIGURE 1

FIGURE 1


115-117%
Generic
Maximum Ramping
Load Following
Regulation